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DESIGN RESEARCH

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## Crafted Futures: a craft/technology collaboration

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**Abstract:** Crafted Futures is a craft/technology visual response to William Gott's Dyehouse Pattern Book produced in 1815 whilst Gott was an apprentice in his father's woolen mill. The work utilised craft practice to explore theories of colour contrast, assimilation and optical mixing in colour production. In collaboration with print technologist Muriel Rigout, applied craft thinking was employed in the development of the work, tacit knowledge of materials and skill were employed with formal colour theory, using textile craft processes and digital print as a modelling tool. The project was important as an example of a craft/technology collaboration, identified as a driver for commercial growth. The success of the project was discussed in terms of individual research outcomes, the success of the visual response and the success of the collaborative process. The work was exhibited at Leeds Industrial Museum, Armley Mills, Leeds, 14<sup>th</sup> October to 27<sup>th</sup> November, 2016.

**Keywords:** Collaboration; craft; digital technology; colour,

## Introduction

This paper will discuss Crafted Futures, a collaborative craft/technology project from the point of view of a designer using craft practice in the design process. It highlights the importance of collaborative practice in a design methodology and situates the project within contemporary economic strategies.



**Figure 1. William Gott's Dyehouse Pattern Book**

Source: <https://library.leeds.ac.uk/special-collections-explore/57697/>

Crafted Futures is a collaborative craft/technology investigation of colour production developed as a response to historic representation of colour research. It considered an original, joint outcome that was the result of two separate research projects. The commission was originally proposed as part of the Yorkshire Year of the Textile, an Arts Council England funded project at the University of Leeds which aimed to highlight textile history and contemporary textile research from across the county in any discipline through public art collaborations. Many of the rich textile collections housed in Yorkshire museums provided initial inspiration. William Gott's Dyehouse Pattern Book (figure 1) produced in 1815 whilst Gott was an apprentice in his father's woollen mill in Leeds and on display in the newly opened Treasures of the Brotherton Gallery at the University of Leeds was a key focus of the year of celebration. It was central to one of the first commissions of the yearlong project, a poetry response to the book by poet Linda France (2016). Elizabeth Gaston textile designer and researcher and Muriel Rigout, lecturer in print technology and researcher, both in the School of Design, University of Leeds were approached by the

organising committee to produce a visual response to Gott's pattern book to be displayed at the Leeds Industrial Museum at Armley Mills, Leeds, a partner in the Yorkshire Year of the Textile. Armley Mills already had an association with William Gott and had hosted an exhibition of dye experiments by the Heritage Dyers Group based at the museum. The group had reproduced Gott's original recipes to achieve a wide gamut of colour on a variety of substrates.

### **Project Aims**

It was recognised that the short lead time between commission and exhibition would preclude the development of a new project, unique to the Yorkshire Year of the Textile commission. The limited time available resulted in the integration of two ongoing projects that would be united through the public art project. Crafted Futures was a precursor to further research from both participants and a communication tool for research already undertaken.

Though colleagues, Gaston and Rigout had not worked together previously, however their common research aims explored the extension of colour gamut in their preferred medium; for Gaston textiles and for Rigout print. The collaboration framed the two disciplines within the same research question; how can colour gamut be extended through manipulation of a narrow spectrum of materials?

Gaston's previous stitch commission was a textile response to the research of structural biologist Michael Levitt the inaugural speaker in the Astbury Conversation, a biennial biological sciences research symposium. This work explored her doctoral findings on colour and pattern manipulation in knitted fabrics through stitch. The Astbury commission utilised craft practice to explore the theories of colour contrast, assimilation and optical mixing in colour production. Layered stitch of varying size and density was used to create a wide gamut of colour from a limited palette of threads. This practice echoed Gott's nineteenth century colour mixing experiments with dyes and was a natural vehicle for exploring his work.

Print technologist Rigout sought to investigate the breadth of colour gamut available in digitally printed natural dyes using madder and indigo. The dyes were based on Gott's original recipes and printed using a Fujifilm Dimatix Materials Printer which enabled a diverse range of materials to be printed on a variety of unconventional substrates. This allowed Rigout to produce innovative digital printing inks from natural sources.

The final work incorporated further colour manipulation through stitch over digital print.

### **The importance of a craft/technology collaboration**

A craft/technology collaboration was timely. Craft as a notion has romantic connotations of a past rural idyll, of lone artisan practitioners, producing bespoke items that are far removed from ideas of mass production and low cost; craft as the antithesis of progress (Adamson, 2010; Frayling, 2001). Since the advent of industrialisation, which introduced the division between design and making, the currency of crafts has lost its widespread value as a commercial necessity in the production of functional products and has become a niche commodity accessible to a few (Dudley and Mealing, 2000). However as Frayling (2001) identifies, there is more to craft value. He re-reads the Bauhaus manifesto of "return to craft", suggesting that craft is more important than industry, as "turn to craft", emphasising the position of craft as a planning or modelling tool in industrial production. The concept of craft as a catalyst for commercial growth is currently being explored by the Crafts Council who commissioned "Innovation through craft: Opportunities for growth" (KPMG, 2016). The report identified craft/technology collaboration as a prime driver for economic development.

### **Digital craft**

The technology strand of Crafted Futures was situated within digitally printed textiles. As early as 1996, McCullough had counter-intuitively identified digital technology as a craft process on two levels. Firstly,



he recognised that to use digital processes effectively required skill and creativity; that a digital interface is essentially a tool, with no distinction from a needle in textile crafts or a hammer in metalworking. It still requires human interaction. Secondly, the use of a digital interface may also enable small producers to compete with large manufacturers who have an economy of scale within their production process (McCullough, 1996). This use of craft and technology for commercial growth is exemplified by Unmade who use the latest Shima Seiki Wholegarment® knitting machines to produce individual bespoke garments for individuals and short production runs for small businesses.

The collaborative use of technology in craft undertaken in Crafted Futures differed from McCullough's view that the use of digital technology is a craft in itself. Instead traditional concepts of craft located in materials and process utilised technology for innovative production. Collaboration in craft is not new despite the pervading view of the craftsman as lone practitioner. Historically craftsmen were organised into guilds, sharing knowledge and marketing. Contemporarily the production of a bespoke couture fashion requires a range of skilled craftspeople, cutters, beaders, embroiderers, etc. all working on the same piece and contributing individual expertise. Crafted Futures was collaboration between participants from independent specialist areas, each contributing different but equally valid expertise, in a similar approach to commercial design practice (Eckert and Stacey, 2000). Furthermore Gaston and Rigout were not directly concerned with the same outcomes; each was investigating a specific but different outcome in the same process so both had control of their own practice.

### **Applied thinking; craft as a methodology**

Perhaps the most interesting aspect of Crafted Futures was its use of craft as a methodology for design. The Crafts Council view of craft as a catalyst to economic change negates the traditional view of craft as an historic practice and situates craft in the future, positioning it as a tool for applied thinking and problem solving. This articulates what has long since been understood by craft practitioners. In 1970 Hepworth described her left hand as her thinking hand as opposed to the motor actions of her right hand, intimating that decisions made during the physical making of her work was inherent in the overall design of her sculpture (Hepworth, 1970, p79). This echoed the design practice in Crafted Futures, where a deep understanding of theory and process was used tacitly in the production of each visual representation. Whilst the tacit knowledge developed through experimentation and iteration in making has great importance in the generation of new ideas, personal tacit knowledge is notoriously hard to articulate which can be hugely detrimental to the success of collaboration (Barret and Bolt, 2010, p3). The lack of common language as a bar to the success of a collaborative project is recognised by the Crafts Council (2016), but they do not offer a solution.

### **Methodology**

There is potential during a craft/technology collaboration for misunderstanding not only in the different language used by participants but also in the methodology used for problem solving. Technology traditionally sits in a positivist paradigm where a defined question can be verified or falsified with a single answer that is revealed through deductive reasoning and can be articulated verbally. Craft has an inherently broader approach to research and development, using divergent thought processes and abductive reasoning; results are often communicated through product or exhibition. The dominance of Positivism as a problem solving strategy in western research has led to a devaluing of alternative strategies and this can act as a bar to successful collaboration between practitioners using different types of research methodology.

This was not problematic during Crafted Futures as both partners in the project acknowledged the expertise of the other in their field of practice and respected the different problem solving methodologies and modes of communication used. This occurred naturally as the two strands of practice remained separate and that each participant completed their element of the project independently. Whilst this was a successful solution in this project considering time restrictions, it should be acknowledged that greater understanding can be developed where there is an exchange of

practice with each contributor and if this occurs successfully, collaboration results in an outcome that would not be possible individually. This is exemplified by the trans-disciplinary craft/dance project *Side by Side* (Carnac and Diallo, 2012) where artist Helen Carnac and dancer Laila Diallo explored each other's practice to extend their own, echoing the modernist ideas of Elsie Fogerty (1937) who questioned whether an artist in one medium can extend the practice of an artist in another. In a review of the project both Gaston and Rigout expressed a desire to collaborate again but with a more trans-disciplinary approach which has the potential to produce wider and more unexpected outcomes.

### **Communication**

Fogerty (1937) also recognised the importance of clear communication and shared language in a successful collaboration. Differing communication channels were identified as one of the main differences between positivist and craft based research (Gaston, 2016) and this was evidenced in the early stages of the project, where the initial project discussion and was framed around an exchange of practice. Gaston took a visual approach, consistent with a craft methodology, showing a variety of previous work, whereas Rigout used a verbal approach, consistent with a positivist methodology, to explain her practice. Any negative effects caused by a difference in communication styles was reduced by the clarity of the aims of the project articulated through a clear research question.

## **Phase one: separate projects**

### **Inspiration**

Both participants had undertaken individual research on the Gott pattern book and again both participants had approached this differently. Whilst Rigout was interested in the recipes included in the book (a verbal approach), Gaston approached the work visually and was particularly interested in the materiality and three dimensionality of the book. An online resource provided by The Treasures of the Brotherton Gallery at the University of Leeds, which presented a digital image of each page of the book, was important to each practitioner (figure 1). The original manuscript is currently on display under glass and so only one page is available concurrently. The digitisation of Gott's original work enabled Rigout to study each recipe but perhaps the greatest impact of the digital images was on Gaston's work. The arrangement of thumbnail images of each page on screen allowed the whole book to be seen simultaneously in a way that would have been unimaginable to Gott. This global view of the book was influential in the form of each piece.

### **Material use**

The two strands of the project were linked through material use referencing the Yorkshire woollen industry. The project was kindly sponsored by A. W. Hainsworth based in Pudsey, West Yorkshire, who have been manufacturing since 1783, and therefore contemporaries of Gott. During a visit to the mill, Gaston and Rigout selected a range of fabric weights to experiment with. They selected an undyed melton (100% merino wool, plain weave, 275gsm), with off-cuts of Hainsworth's finer weight merino cavalry twill (100% merino wool) in air force blue and a heavier weight melton (100% merino wool, plain weave, 340gsm) in scarlet, referencing Hainsworth's history of supplying military uniform fabrics.

### **Colour**

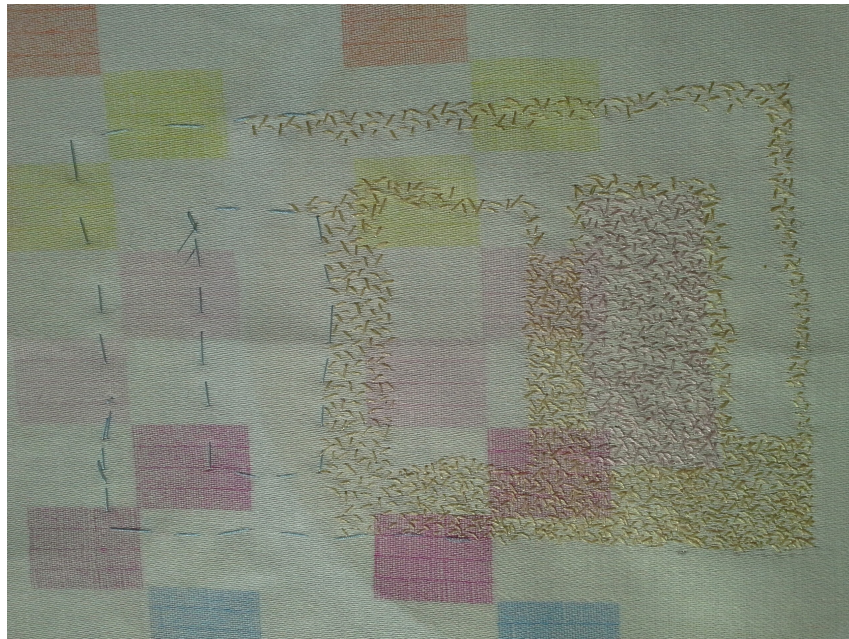
Gaston's previous colour research was predominantly situated in knitted fabric, more specifically investigating the inter-relationship of colour, form and the knitted stitch in the perception of pattern in Fair Isle knitted fabrics. Of particular interest was the instability of contiguous colour produced through mechanisms such as contrast, assimilation and optical mixing. This work had employed a tacit knowledge of materials and process with formal colour and pattern theory, using textile craft processes as a modelling tool. The outcomes were communicated in exhibition and performance as well as a traditional written thesis (Gaston, 2016). This successful methodology was employed during the creative practice of *Crafted Futures*.



**Figure 2. Colour palette created by optical mixing**  
Source: Photograph Elizabeth Gaston



**Figure 3. Blend of original thread colour**  
Source: Photograph Elizabeth Gaston

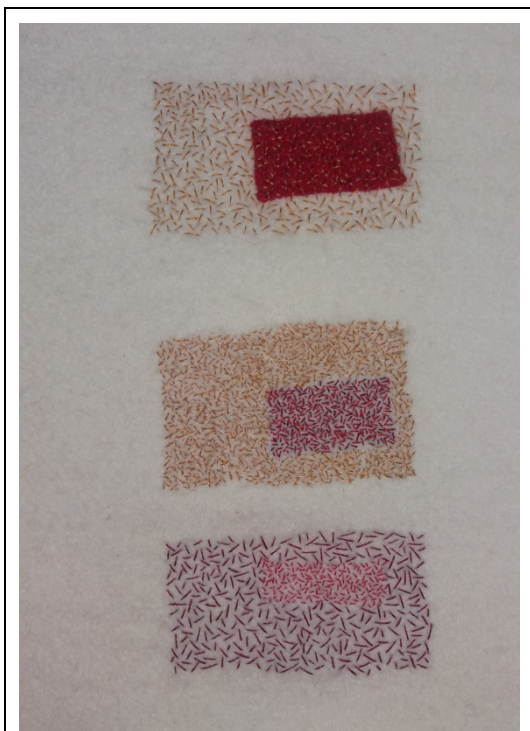


**Figure 4. Test swatch demonstrating assimilation of colour.**  
Source: Photograph Elizabeth Gaston

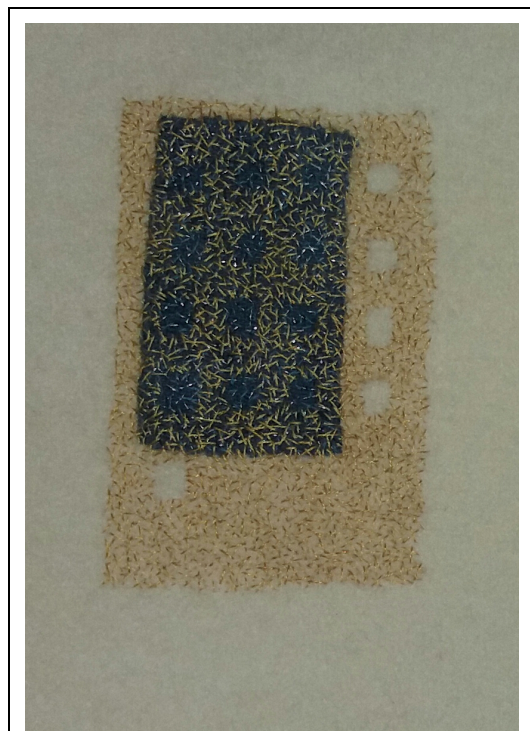


The creation of the colour gamut used in the work was evolutionary. Previous work in stitch had identified the ability to exploit optical mixing which is commonly used in textiles (figure 2). The new work produced for Crafted Futures furthered this work through a wider exploration of the effect of stitch density and assimilation on colour perception of optically mixed colour based on a limited intuitive palette (figure 3). Initial tests using a dense seed stitch over a coloured background created conditions that promoted assimilation rather than contrast effects (figure 4). This caused the colour of the stitch to become more similar to the background, for example the yellow appeared “yellower” and the pink became “pinker” when the thread and background colour were similar in terms of hue and saturation.

This occurred less in the final pieces where a more saturated colour was used in the background however using the scarlet background emphasised the variation in hue modification that could be achieved through varying the stitch density (figure 5). An unexpected visual effect that was achieved was the appearance of illusory brightness in areas of negative space in the stitch. This effect causes background areas with a low spatial frequency (no stitch) to appear brighter than the background in areas with a higher spatial frequency (dense stitch) (Kanizsa, 1979) (figure 6).



**Figure 5. Optical mixing affected by stitch density**  
Source: Photograph Elizabeth Gaston



**Figure 6. Illusory brightness caused by differing spatial frequency of stitch**  
Source: Photograph Elizabeth Gaston

Rigout focused on developing a range of primary colour inks starting with red using madder as a dye and blue using indigo as a dye (figure 7). These dyes were selected for their widespread availability. The inks produced were dilute in terms pigment content and were printed at four strengths, the strongest being 100% ink at 65 DPI. Both colours were printed on pre-mordanted un-dyed melton. Alum (potassium aluminium sulphate) was used as the mordant for the madder and sulphuric acid was used as the mordant for the indigo. Pre-mordanting the fabric was problematic in terms of the finished print in that

drying the pre-mordanted fabric before printing would affect the effectiveness of the mordant. Due to time constraints there was a three month break between applying the mordant and the final printing which allowed mildew to form on the fabric causing discolouration. To create a stronger depth of colour the test samples were over printed. Two test pieces were produced, one red and one blue.

### **Form**

The form of each piece of Gaston's work was informed by the layout of pages in Gott's original manuscript. This was revealed when digital images of the separate pages were viewed concurrently on screen. The form of the pages was explored initially in paper using mark making and intercutting in a variety of media. The final form wasn't a direct representation of a particular page but an amalgamation of ideas from several pages. The colour used referenced both the colour in Gott's original work and the colour used in the exploratory paper research. In many cases the form of the fabric swatches in Gott's pattern book appeared as negative space in the paper work and consequently in the final works.

Rigout used a formal arrangement of test squares arranged in four rows of five squares, the colour in each row being progressively stronger (figure 7).

### **Materiality**

Gaston's initial interest in Gott's pattern book had been in the three-dimensionality of the book. Each page had swatches of dyed fabric attached to it which had added bulk to the book and caused page distortion. In some areas the swatches had fallen out and left only an imprint of the fabric. This was referenced in one of the final pieces. All of the stitch work was produced using undyed melton fabric. The areas of stitch changed the materiality of the fabric, adding structure and reducing flexibility. Further three-dimensionality was created through the use of appliqué using the finer weight cavalry twill and the heavier melton.

### **Limitations**

During the production stage of the commission the two projects separated and there was little communication between the partners about the development of the individual strands of work. This was not problematic in that the two defined projects had separate aims and could develop concurrently. The major drawback to the separateness of the projects was a difference in time expectation. Hand stitch is an inherently slow process and as such for Gaston to be able to work with Rigout's experiments they needed to be completed much earlier in the process. Unfortunately due to prior commitments and a series of unavoidable technical delays Rigout was not able to complete as much work as anticipated before Gaston started developing the final work for exhibition. This was a result of poorly defined planning at the start of the project in terms of communication of timescales required for the craft production. However as applied craft thinking was employed in the development of the work, with the outcomes determined by the craft process, the final outcome was not known at the start of the project reducing the ability to produce a defined timeline. The result of this oversight was that much of the early work in the project was completed using Gaston's work on its own.

### **Outcomes**

Initially five pieces were produced and were exhibited at the Stanley and Audrey Burton Gallery, Leeds (4th May-17th September 2016). The first iteration of Crafted Futures did not include any of Rigout's experiments. The work was received well critically and was considered visually successful.

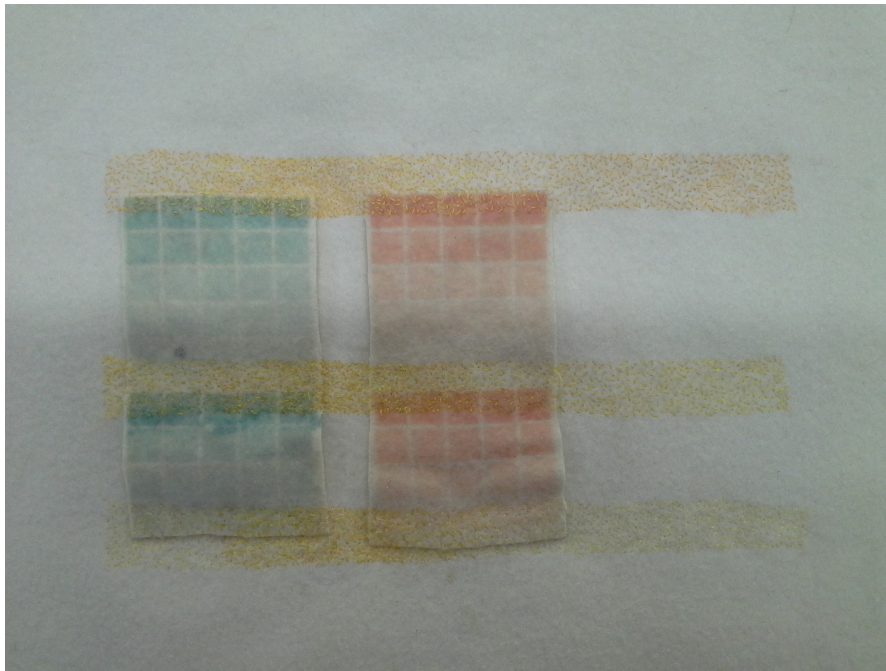
## **Phase 2: integration of practice**

During the first exhibition period Rigout's initial print experiments were completed, allowing Gaston to produce an integrated outcome. The lateness of the print research resulted in no further development of the layout of the print. The discolouration of the printed fabrics caused by mildew resulted in the

need to crop the prints and apply them to clean melton echoing the appliqué used in phase one of the project.

#### Colour manipulation

The tonal levels of the print approximated that of the initial test pieces that had clearly demonstrated assimilation so these experiments were extended by over stitching a tonal range of yellow threads at a variety of stitch densities. Again the form of the work was inspired by the layout of Gott's pattern book. The work demonstrated optical mixing in areas of high spatial frequency (high density stitch) but assimilation in areas of lower spatial frequency (lower density stitch), indicating that the stitch density had an effect of colour manipulation in stitch (figure 7).



**Figure 7. The integration of print and stitch outcomes**

Source: Photograph Elizabeth Gaston

#### Further Outcomes

In preparation for the second iteration of the exhibition (figure 8), which was held at the Leeds Industrial Museum, Armley Mills (4th October -26th November 2016,) Gaston returned to both the manuscript and to France's poetry response to the manuscript for inspiration. France had used many of the colour names cited by Gott to describe his experiments, and used them as a refrain throughout the poem. This was used to inform colour choice in the last two pieces of the series with particular reference to the lines "*lavender, peach, Saxon blue*", "*fustic, indigo, madder*" and "*lilac, salmon, bronze*" (France, 2016). Gaston's background of knit design and research was also evident in the final two pieces which referenced her original colour research, albeit in process (knit) and not technique (Fair Isle). Using knit Gaston described the form of the colour swatches in Gott's manuscript both three dimensionally and in texture. Stitch remained the focus of the colour work.

#### Evaluation

Crafted Futures was evaluated on three levels, in the first instance as an outcome of two separate research projects, secondly as a visual art outcome and finally the success of collaboration was assessed.

#### **Success of individual projects**

Gaston and Rigout both sought to increase the colour gamut available in their chosen medium. In this research, success of the development of understanding revealed during the making process was measured intuitively using practice based assessment. Both participants were satisfied with the outcomes of their work but could clearly see the possibility for an extension of practice.

Due to time constraints Rigout successfully digitally printed a tonal range two colours using natural dyes. The colour was fast to basic wash tests but was not tested for light fastness. The colour and form of the print was clear but there were problems with staining of the printed fabrics. A continuation of this project would extend the colour range attempted and resolve technical problems revealed during the fixing process.

Gaston confirmed that much of the pattern perception findings revealed during her doctoral research (Gaston, 2016) was relevant to the stitch undertaken in this investigation. This was particularly pertinent to optical effects such as assimilation and optical mixing. The work demonstrated that not only colour but stitch density was important in the creation of new colour. A continuation of this project will investigate colour production through stitch using a more controlled methodology using clearly defined criteria, echoing a Positivist approach. This may provide a deeper understanding on which to base further creative practice.

#### **Success of public art outcomes**

The outcomes of Crafted Futures were exhibited in two respected regional galleries, in both instances to critical acclaim, confirming the visual success of the project assessed using Dickie's Institutional Theory (Warburton, 1992, p163). The project is also cited in Connecting Threads (Cassé and Jones, 2017), a publication celebrating the Yorkshire Year of the Textile.



**Figure 8. Crafted Futures exhibited at The Leeds Industrial Museum, Armley Mills (2016)**

Source: Photograph Elizabeth Gaston



### Success of collaboration

Perhaps the success of a collaboration should be measured by the willingness of participants to work collaboratively again. By this measure the collaboration in the production of Crafted Futures was successful with both partners expressing their desire to continue with the project in some form. There were of course some problems, in particular the lack of communication of the timescales of production necessary to complete both of the separate research areas. Clearer communication of expectations from both partners would be required in further work. The project was fortunate that no conflicting ideas of either creative practice or research strategy/methodology arose but this would be an area to consider carefully in further craft/technology partnerships.

The identification of a craft/technology collaboration as a driver for economic growth was not explored fully in this project and it is expected that a more trans-disciplinary approach to further work will allow the development of commercial outcomes. In this way the project revealed that the craft practice was perhaps not research itself, but a tool for experimentation that can lead to new understanding (Mäkelä and Routarinne, 2006, 13-23).

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